

For Legislators on Wireless Smart Meters: HEALTH and SAFETY ISSUES

by Richard H. Conrad, Ph.D. Biochemist

May 12, 2014

PART I: Safety legislation is urgently needed

To ensure that any new metering systems installed on homes and businesses are safe for continuous human exposure, new legislation must be written to guide the PUC. Here are the reasons:

The pulsed microwave emissions from wireless smart meters being used in grid modernization systems result in involuntary household microwave exposure, and:

- are not adequately regulated by the FCC (this has been confirmed by the EPA)
- have been classified as a possible human carcinogen by the WHO
- have not been tested for human safety
- have been the cause of unusual and severe insomnia, headaches, tinnitus and heart arrhythmias in thousands of persons
- peer-reviewed research publications from all over the world have shown that similar emissions have potentially hazardous effects
- smart meters utilizing wireless communications present an extremely dangerous combination of open portals, wireless hacking, power cutoff switches and adverse health effects
- safe alternatives do exist.

We rely on you for our safety. The reason grid modernization health safety has to be enforced by legislation is that the smart meter manufacturers, most PUCs and utilities have been less than honest (see “A List of Myths” in Part II). They do not disclose the fact that FCC regulations protect only against gross overheating and do not protect from biological harm caused by low (“non-thermal”) levels of microwaves. Wireless smart meters emit non-thermal levels 24/7, and exposure is inside every home and involuntary. This is of urgent public concern.

From the EPA: “The FCC's current (radio frequency/microwave) exposure guidelines, as well as those of the Institute of Electrical and Electronics Engineers (IEEE) and the International Commission on Non-ionizing Radiation Protection, are thermally based, and do not apply to chronic, non-thermal exposure situations.....the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified.” Norbert Hankin of the EPA's Office of Air and Radiation, Center for Science and Risk Assessment, Radiation Protection Division, July 16, 2002.

The FCC's guidelines can show a device to be *unsafe*, but cannot prove that a device is safe. Non-thermal levels of exposure are simply not regulated by the FCC. There are thousands of peer-reviewed studies showing potentially harmful biological effects of non-thermal levels of microwave radiation. Some of these studies were done

with humans, and most were on mammals with nervous systems and biochemistry nearly identical to humans. The sheer volume of these studies is cause to strongly infer human risk until proven otherwise, especially since some of the studies done directly on humans do show harm. Furthermore, the World Health Organization has classified low level non-thermal microwave emissions, *specifically including* that emitted by (wireless) smart meters, as a possible human carcinogen.

No research or testing has been done on the effects of smart meter emissions on humans, with the exception of three different surveys which report human sensitization to smart meter emissions resulting in unusual and severe: insomnia, headaches, tinnitus and heart arrhythmias.

Opting out is not a solution. Even if a homeowner is allowed to opt out, they are still involuntarily irradiated 24/7 by neighbors' smart meters, especially when there are whole banks of smart meters nearby.

Wireless smart meters create huge privacy and security problems. Information about the private daily lives of everyone is extractable from data stored in smart meters and periodically transmitted wirelessly to the utility. Utilities have no right to have this information; this is a severe invasion of privacy and should be illegal. The ACLUs of Hawaii, Northern California and Vermont have issued strong statements concerning smart meters and their violation of privacy. Most wireless smart meters contain cut-off switches that are remotely controlled by wireless signals from the utility. *Wireless* data transmission and remote control will never be completely immune to hacking (Google smart meter hacking).

Because the smart meter manufacturers have denied all these problems, we need you to legislate our safety. Most PUCs and utilities have accepted the propaganda that has been fed to them. This propaganda is not merely biased, but includes willful omissions of facts, misleading claims and statements that are not true (see "A List of Myths" in Part II). Industry's response to public outcry due to health effects, privacy and national security issues has been denial, and: "the public needs more education".

Defining Safety within Legislation. Simply using the word "safe" or "safety" in relation to grid modernization is inadequate. Does "safe" mean fewer brown-outs and outages, safe from hacking and external control, and/or safe for human health? Particularly concerning human health, safe and unsafe must be defined within legislation. It is very important to include language to the following effect:

"Any type of smart metering system, network or grid modernization technology that the PUC deploys must be safe for human health, and can be considered safe only if there is no reliable evidence (direct or indirect) showing that it may be a risk to human health. A technology is to be considered unsafe if there exists reliable and reproducible evidence of an adverse effect. If substantial conflicting evidence exists also, the

technology must still be assumed to be a risk, and deployment must be at least delayed until unbiased scientific experiments have resolved the conflict. ('Direct evidence' would be adverse effects on humans of low levels of pulsed microwaves emitted from smart meters or from other devices producing similar levels of pulsed microwaves. 'Indirect evidence' would be adverse effects on other mammals.) Evidence of adverse effect can be empirical, that is, without knowledge of mechanism."

There are further safeguards that must also be written into legislation (see the "Safeguards" and the "Safe Alternatives" sections in PART II).

PART II: Detailed supporting information

My Qualifications [1]

I am well qualified to write about this subject because I have a Ph.D. in biochemistry from Johns Hopkins University and did postdoctoral research at the Institute of Molecular Biophysics of Florida State University and in the Department of Biochemistry of Cornell University. I have ten U.S. Patents, including three for electronic devices. I am the main author of a "Smart Meter Health Effects Survey" [2], and am an expert witness in the Maine, USA smart meters case [3] where the Judge ruled that the Maine PUC must demonstrate that the smart meter system already deployed in that state is safe for human health.

My Objective

My objective is to help protect the health and the privacy rights of the public and national security. I am convinced of the serious problems created by *wireless* smart meter systems, not because of any beliefs or preconceived opinions, but as the logical result of extensive research, much of which I present below. If you would like more detail on any aspect, contact me at rconrad999@hawaii.rr.com.

More on the FCC's MPE

The FCC's Maximum Permissible Exposure (MPE) standards do not protect humans from the biological effects of lower (non-thermal) levels of pulsed microwaves:

EPA: Before the EPA shut-down all its research on microwave effects, two of their researchers found that "microwave radiation directly inhibits mitochondrial energy production pathways in rat brain, and that tissue heating is not a factor." From a Project Summary by A.P. Saunders and Wm. T. Joines, EPA-600/S1-82-014, Jan. 1983.

EPA: The FCC's exposure standards are "seriously flawed." Official comments to the FCC on guidelines for evaluation of electromagnetic effects of radio frequency radiation, FCC Docket ET 93-62, November 9, 1993.

FDA: "FCC rules do not address the issue of long-term, chronic exposure to RF fields." Comments of the FDA to the FCC, November 10, 1993.

NIOSH: The FCC's standard is inadequate because it "is based on only one dominant mechanism - adverse health effects caused by body heating." Comments of NIOSH to the FCC, January 11, 1994.

ARRL (American Radio Relay League, the national association for amateur radio): "The FCC's standard does not protect against non-thermal effects." Comments of the ARRL Bio-Effects Committee to the FCC, January 7, 1994.

Thousands of research papers show significant non-thermal effects [4]. But the FCC (OET Bulletin 56) states that its MPE protects only against "*recognized hazards*" (overheating and shock). Since non-thermal biological effects have not been officially recognized as being a hazard to humans by a U.S. Government agency, the FCC is essentially saying that their standards do not protect against non-thermal effects.

The FCC goes on to say that: "relatively little civilian-sector RF research is currently being funded by the U.S. Government. At the present time, much of the non-military research is being funded by industry organizations such as Motorola, Inc." In other words, none of the bodies doing research are likely to publicly release a verdict of "unsafe".

Since the FCC currently rejects the "Precautionary Principle" that is used in Europe, one would think as a logical alternative they would actively sponsor independent research focused on non-thermal effects, and until the results come in, issue public warnings. The FCC, EPA and FDA have repeatedly said that more research is needed, but they do not sponsor it. No additional research, no warnings, only proliferation of *even more* emissions.

If a device causes exposure greater than the MPE, the FCC standards are appropriate for declaring that device unsafe. But it does *not* logically follow that a device is safe just because it produces exposure less than the MPE. It is an understatement to say that much hangs on this convenient misuse of the MPE.

In other words, the MPE can be employed to declare a device *unsafe* but can not legitimately be used to claim that a device is *safe*. In spite of this, utilities test smart meter emissions to show that they conform to FCC guidelines and then on this basis erroneously claim them to be "safe". But non-thermal levels of exposure that are known to cause biological effects are simply not regulated by the FCC. (Also not regulated are maximum pulse height, type of modulation and microwave energy conducted on wiring.) All of this adds up to "use at your own risk", and yet wireless smart meters are mandated and the result is involuntary 24/7 exposure.

Nine countries (including China, Russia and much of Europe) representing 40% of the world's population, have much lower exposure limits than the U.S.; some countries have established guidelines more than 100 times lower. Certainly China and Russia are not known to be overly protective of their populations.

Emission from Wireless Smart Meters is Classified a Group 2B Human Carcinogen

The World Health Organization's International Agency for Research on Cancer (IARC) has classified microwave radiation, *specifically including that emitted by smart meters*, as a Group 2B human carcinogen. This means that in order to continue to receive electrical power, people are forced to live with a device on their homes that emits possibly carcinogenic microwaves 24/7. The public remains unprotected, and at the mercy of industry's rapidly proliferating technology.

Industry's Propaganda

Industry has woven a superficially convincing propaganda network of extremely dishonest hype. Their spin includes such statements as: "there are no harmful non-thermal effects". But research strongly suggests otherwise. From Itron literature: "The total RF exposure from multiple meters in meter banks is effectively no greater than that of a single meter". This is absolutely incorrect. Itron also writes that smart meters do not emit "pulsed RF", rather they transmit "packets". But they are RF pulses nonetheless. PG&E has said "SmartMeters communicate intermittently.....These intermittent signals total, on average, 45 seconds per day. For the other 23 hours and 59 minutes of the day, the meter is not transmitting any RF". This is misleading because numerous pulses are emitted every minute around the clock, and PG&E was forced to admit to about 10,000 pulses per day on average, with some smart meters emitting up to a maximum of 190,000 pulses per day (which when divided by the number of minutes in a day equals over 100 pulses per minute).

You may hear arguments from the IEEE and industry that the microwave emissions from wireless smart meters are so minuscule they are insignificant compared to ambient Wi-Fi and cell phone signals. But in fact smart meters are turning out to be one of the strongest sensitizers of Electrical Sensitivity (see "Adverse Health Effects" below). Industry's comparison charts of RF energy levels emitted from smart meters versus cell phones and other devices pretend to show that cell phones cause up to 500 times more exposure than smart meters. The levels reported are false [5], as well as their claim of "natural RF from the human body" (no radio frequencies are emitted by the body). Richard Tell reported [6] (page 90) that the averaged intensity of microwaves one foot from a cell phone is about the same as the averaged intensity at one foot from a smart meter.

Although a person is much closer to a cell phone while using it than they are to a smart meter:

- 1) the pulse/modulation patterns and frequencies of these devices are very different, and therefore their biological effects will be different;
- 2) cell phones are not used while sleeping, whereas smart meter exposure is sustained all night long, while the body is in repair mode;
- 3) smart meters appear to be more sensitizing than cell phones; and
- 4) cell phone use is voluntary while smart meter exposure is involuntary.

Industry proclaims repeatedly: “smart meters are safe”. This statement parrots what certain agencies such as the WHO have said on the basis of what the IEEE and FCC have said; the latter are engineers not biologists, and have done no research. Industry claims: “Scientific study from credible third party health and research organizations has shown that smart meters are safe.” But there has never been any smart meter testing on animals or humans, not by anyone.

As a research scientist, I find that more than half the claims of smart meter benefits I have read in smart meter brochures and FAQ’s use twisted logic and are misleading or worse. I will be happy to discuss these further, point-by-point, if you contact me at: rconrad999@hawaii.rr.com. Without the spin, their arguments fall flat.

Where is the data from any smart meter installation, nationwide, showing cost or energy savings? Are smart meters more cost effective than if the stimulus money had been spent on solar subsidies? The brochures proclaim: “safety, security, privacy, accuracy.....More secure and reliable.....The technology has now matured and experience has shown it to be safe, efficient, and reliable.” The reality, the actual smart meter track record, has been quite the opposite of safety, security, privacy, accuracy.

The old analog electromechanical meters emit no RF, are safe, secure, private, accurate, efficient and reliable and should be the reference standard that any new system should match or exceed in all its parameters. Furthermore, smart meter technology is *not* mature by any stretch of the word. Luckily, there is much room for improvement. The wireless smart grid as now planned will never be safe from hacking. In that regard it cannot maintain the level of safety that the old analog meters do. This is also the case concerning health safety.

Adverse Health Effects

Wireless smart meters and wireless mesh systems do affect human biology and health. See articles by Ronald M. Powell, Ph.D. in applied physics [7], [8], [9]. In most places they are installed, wireless smart meters create a minor epidemic of Electrical Sensitivity (ES) [2], [10], [11]. ES is a kind of physical allergy to electromagnetic fields (EMF). Smart meters seem to be the worst of the sensitizers that initiate ES in previously normal people. We don’t know why yet because there has been no research, but what causes sensitization may not be the intensity of the microwave signal, but its particular type of pulsing and modulation (see “The Devil may be in the Details” in the Notes section at the end of this article). After the initial sensitization, smart meter exposure continues to re-trigger disabling symptoms, including unusual and severe: insomnia, headaches, tinnitus, heart arrhythmias and other symptoms characteristic of ES. Because of these symptoms, persons who develop ES cannot any longer use Wi-Fi or the cell phones they need for their work. Nor is it possible for most of them to remain productive members of society, or even to find a place that is safe for them to live. Many are astute professional people, including Ph.D.’s, M.D.’s, engineers and programmers. They *want* to work. Read their testimonials before making any judgment. (See the links to testimonials in the ADDITIONAL REFERENCES section near the end of this article.)

Repeated inadvertent blinded experiments that resulted in symptoms before they were aware of the emission source showed them that they were reacting to the emissions, in spite of this being contrary to their wishes and initial beliefs. Their unusual symptoms correlated repeatedly to exposure and to nothing else. This is evidence that wireless smart meters are not safe; they injure people. A very inconvenient truth.

ES is due to EMF

The telecom industry admits that ES exists, but would have you believe that it is not due to EMF. But there *is* clear cause and effect, in spite of industry-sponsored junk science that claimed otherwise. (This was poorly conducted, poorly controlled research that conveniently misinterpreted ES as being electromagnetic *sensing*; instead of looking for objective systemic symptoms of *sensitivity*, they set up a straw man and then knocked it down.) In reality, ES is both initially triggered by, and then repeatedly re-triggered by EMF exposure, including from smart meters, whether or not the person was initially aware that the EMF or smart meter was present.

From the few studies that have been done on humans, pulses similar to that from smart meters cause changes in brainwaves even in persons *without* ES [12]. From thousands of biological studies on the effects of low levels of EMF [4], it is highly likely that emissions from smart meters affect even the general population. The most noticeable effects in the short-term may be anxiety and insomnia. Also likely are subliminal changes in neuropsychological functions, leakage of the blood-brain barrier, increased oxidative damage including DNA breakage, and susceptibility to auto-immune diseases and cancer. For ES persons, wireless smart meters are intolerable; for the general population, risky. ***What percentage of the population will have to become electrically sensitized before something is done about it?***

Insult to Injury to Extortion

It does not make sense to grandfather in microwave exposure from smart meters on the basis of already having exposure from cell phones. Why add even more possibly carcinogenic microwave radiation to our environment? The big difference between cell phones and wireless smart meters is that people have the freedom of choice to either use or not use cell phones inside their own home, but would be forced to be exposed to a microwave transmitter attached to their home 24/7 unless they pay an up-front and then monthly *extortion* fee, assessed solely to discourage opting out. Opting out does not increase costs for utilities if they use a system where consumers report usage readings monthly via post card or touch tone phone; these work very well. ***But opting out does not help much if a person has close neighbors - this very real problem can only be solved by using a system that is not wireless.***

Bait and Switch

Some utilities say “no opt-out fees initially” but they usually try to add them later. They claim no ability to control our appliances at first, but may add that later; no transmitter at first, but may add it later. You won’t be allowed to (or be able to afford to) run your A/C when it is hot out, or to run your washing machine and dryer when you need to. Your life will be controlled by a utility company. A sacrifice for the good of the planet? No, for

the convenience and profit of the utilities. Industry's version of this is: "For consumers, smart meters mean more control over how energy is used...." (control by the utilities). Customers already have control over their own usage and certainly won't want utilities to control it. See "Time of Use Billing" at the end of "Notes" section. Furthermore, pilot studies have revealed that only a tiny fraction of customers want the ability to monitor their usage in detail.

A List of Myths

Here are some of the myths being disseminated; they have as much substance as the Emperor's new clothes:

- Smart meters have been tested for human safety;
- The FCC standards protect against all harmful effects;
- Non-thermal levels of microwave emissions are innocuous;
- WHO classification as a possible human carcinogen should be ignored;
- Evidence of self-reported symptoms should be discarded (are migraines not real?);
- We need to continuously monitor your home's usage;
- You can trust us with your data;
- We can keep ahead of all hackers;
- Wireless smart meters are necessary to integrate renewables into the grid.

Therefore there is an urgent need to define safety of all kinds within legislation. Even more so when you ***consider the very dangerous combination of the following four properties of today's smart meter systems:***

An Extremely Dangerous Combination

- (1) an open portal mega-information tapping device on every home; plus
- (2) a source of carcinogenic microwaves and potential weapon of mass debilitation on every home - pulsed microwaves like those the Russians beamed into our Moscow Embassy - smart meters already cause disability in some persons when pulsing less than 1% of the time; imagine what these meters could do if a hacker boosted the pulsing to 50% or more; plus
- (3) a power cutoff switch on every home (now included inside most smart meters, which introduces the possibility of turning off everyone's power at once); plus
- (4) all the above controlled through a perpetually hackable wireless mesh network.

I recognize insanity when I see it, and this is, well - what do ***you*** think? Is this in keeping with American values, or is it a recipe for disaster? Controllable en masse from the outside with a few lines of software and the push of a button. Even if adverse health effects were left out of the picture, it would still be a highly inadvisable system - far too susceptible to abuse.

Does it make sense to weave an infrastructure throughout our State and whole nation that requires our security people to always be smarter and a step ahead of the best hackers in the world? We have a powerful military that won't be able to protect us if we install hundreds of millions of moles, one on each house and business. We would not go out with a bang, but gradually with a whimper, to the whisper of quadrillions of microwave pulses.

Big Brother

This plan must have been hatched either by people who are advocates of a "Big Brother is Watching You" type of government, or bureaucrats with no foresight. It authorizes the attachment of strings to all of us for anyone in the future to easily pull, and then, voila, no more freedom. If something analogous to this was created right after the American Revolution, the persons who planned it, as well as the persons who allowed it, would be hung as traitors.

Global climate change is very real, and we need a more modern grid especially to handle distributed energy, but this is *not* the way to go about it. Look at what is **really** being done to America by this ill-conceived part of the industry - DOE - NSTC (National Science and Technology Council) plan. The power industry is interested in only one thing - the money. They have repeatedly demonstrated that they really don't care about consumers, the planet, America or the Constitution.

Safeguards

There has been an enormous amount of deception by smart meter manufacturers, utilities and installers, and also strong-arm tactics on the part of utilities and installers: using the police to force installation in Naperville (Illinois) and arresting homeowners who resisted; disregarding City Council bans on smart meters in California and continuing to install; disguising a smart meter as a mechanical analog meter; cutting off a homeowner's power if they refuse a smart meter or refuse to pay opt-out fees or if they re-install their own analog meter etc. Therefore safeguards to prevent these violations of human rights must be included in legislation. Regulations should have enough teeth to prevent utilities from violating them, and hopefully be strong enough to resist or supersede any Federal law that might be passed to mandate wireless smart meter systems. For additional details see "More on Safeguards" in the Notes section at the end of this document.

Safe Alternatives

There are alternative ways to meet all necessary energy goals, and without corollary damage to our freedom and health. It is possible to design a new modern grid that accomplishes what we really need and at the same time:

- 1) does not infringe on consumers' privacy rights,
- 2) poses no risk to the human body (i.e., has no wireless transmitter),
- 3) has no remotely controlled power cut-off switch,
- 4) is much less susceptible to hacking, and

- 5) includes consumer-settable timers on electric hot-water heaters, but no “wireless smart” appliances at all.

This would satisfy the large segment of the population that is presently against smart meters, and would provide a homogeneous, integrated and safe system acceptable to everybody. We might not have to waste money and time trying to reinvent the wheel; we should look in other parts of the world to see which types of modern grid systems are not working for people and which ones are working well. Using telephone wires to send usage data is one option - for this and many other reasons it would be extremely unwise to allow the dismantling of our national wired telephone network.

In at least some areas of Ontario, Canada, smart meters have no transmitter, and instead incorporate a modem that sends data over wired phone lines. The city of Chattanooga, Tennessee and some areas in France use optical fiber. But any phone or optical modems would have to be well shielded and filtered to be safe for everyone. For more on safe alternatives, see “Suggestions for Alternatives” in the Notes section at the end of my article: [\[13\]](#) “Nine Reasons Why Today’s Smart Meter Systems are a Mistake”. For a detailed description of why Power Line Communication (PLC/BPL) is *not* a safe alternative, see the latter article and also [\[14\]](#).

CONCLUSION

- To any honest scientist who reads the research literature, especially the results of European studies, it becomes clear that non-thermal levels of pulsed microwaves definitely pose a risk to human beings. Many non-thermal effects have been found that should raise red flags, but instead these are ignored by our regulatory bodies as if they simply do not exist.
- The FCC has essentially declined to protect the public from non-thermal effects. So far, “safety” as it applies to devices that emit non-thermal levels is by empty proclamation only: “if no heat, then no effects”.
- Very little further research on non-thermal effects on humans is being done at this time, except for huge involuntary smart meter experiments on humans whose results are not being looked at by industry but point very strongly to risk.
- Any PUC or utility that bases claims of “no health effects from smart meters” on FCC standards is hiding behind non-existent liability protection. Anyone deploying wireless smart meters is skating on thin ice. It will be far less expensive in harm, liability and infrastructure cost to switch to safe alternatives now, rather than later.

The smart meter industry and utilities are playing a shell game with the facts, and you are the ones who can call them on it. The tide is turning against privacy violations and ignorance of harm from wireless devices.

Don't allow any more public money to be thrown away on a system the public is resisting and will resist even more in the future; don't allow a system to be put into place that has a risk of collateral damage to public health, erodes personal rights and paves the way to a totalitarian state.

We rely on you to remedy this situation and pull us back to sanity. Put a stop to the deployment of wireless smart meters.

IMPORTANT EXTRAS

If you read only one additional article, read this to-the-point article by a Mayor:

<http://smartgridawareness.org/2014/04/28/mayor-makes-appeal-to-conscience-of-legislators-on-smart-meters/>

If you watch only one video clip this week, watch this one (7 minutes): "The utility company doesn't care about the canary in the coal mine":

<http://smartgridawareness.org/2014/04/24/worcester-city-council-committee-requests-smart-grid-delay/>

For background information, click on the following two links:

a) My article "Nine Reasons Why Today's Smart Meter Systems are a Mistake":

<http://skyvisionsolutions.files.wordpress.com/2014/04/nine-reasons-why-smart-meter-systems-are-a-mistake-19-april-2014.pdf> and also:

b) "The problems with smart grid/metering are so legion and potentially catastrophic that it boggles the mind.":

<http://smartgridawareness.org/2013/08/27/the-smart-grid-is-not-smart-safe-or-green>

REFERENCE LINKS

[1] My CV: <http://www.conradbiologic.com/mycv.html>

[2] For the full results of the "Smart Meter Health Effects Survey" see its report:

<http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2013/01/Exhibit-10-Smart-Meter-Health-Effects-Report-Survey2.pdf>

[3] For my testimony as an expert witness in the Maine, USA case against smart

meters: <http://www.mainecoalitiontostopsmartmeters.org/2013/02/introduction-to-our-puc-filings-of-expert-and-lay-witness-testimony/>

[4] <http://www.bioinitiative.org>

[5] "A Critical Review of Smart Grid Industry Comparisons of Cell Phones with Smart

Meters": <http://smartgridawareness.org/2014/02/07/review-of-smart-meter-and-cell-phone-comparisons/>

[6] Richard Tell, "An Evaluation of Radio Frequency Fields Produced by Smart Meters Deployed in Vermont", page 90: http://www.smartgridinformation.info/pdf/4973_doc_1.pdf

[7] “Biological Effects from RF Radiation at Low-Intensity Exposure, Based on the BioInitiative 2012 Report, and the Implications for Smart Meters and Smart Appliances” by Ronald M. Powell, Ph.D. physicist: <http://marylandsmartmeterawareness.org/wp-content/uploads/2013/10/Biological-Effects-from-RF-Radiation-and-Implications-for-Smart-Meters.pdf>

[8] “Symptoms from smart meters; a short summary of survey key results” by Ronald M. Powell, Ph.D.: <http://marylandsmartmeterawareness.org/recources/symptoms-resulting-from-exposure-to-radiofrequencymicrowave-radiation-from-smart-meters/>

[9] Another excellent short article by Ronald M. Powell, Ph.D.: <http://smartgridawareness.org/2014/04/20/the-health-argument-against-wireless-smart-meters/>

[10] An earlier survey, “Wireless Utility Meter Safety Impacts Survey”: http://skyvisionsolutions.files.wordpress.com/2014/01/halteman_survey-results-final.pdf

[11] AAEM Letter with summary of preliminary results from a forthcoming survey: <http://skyvisionsolutions.files.wordpress.com/2013/11/aaem-wireless-smart-meter-case-studies.pdf>

[12] “Mobile-phone pulse triggers evoked potentials”: <http://andrewamarino.com/PDFs/160-NeuroLetters2010.pdf>

[13] “Nine Reasons Why Today’s Smart Meter Systems are a Mistake”: <http://skyvisionsolutions.files.wordpress.com/2014/04/nine-reasons-why-smart-meter-systems-are-a-mistake-19-april-2014.pdf>

[14] <http://eiwellspring.org/PLC.html>

ADDITIONAL REFERENCES

For personal testimonials of serious health effects, see Appendix 6, page 65 in reference [2] above, and also:

<http://www.conradbiologic.com/pdfs/Santa-Rosa-Smart-Meter-Hearings.PDF>

“Smart Meters: Correcting the Gross Misinformation”: <https://maisonsaine.ca/sante-et-securite/electrosmog/smart-meters-correcting-gross-misinformation.html>

ACLU: “data is ending up in the hands of third parties”: <https://www.aclunc.org/blog/call-logs-try-kilowatts-reports-reveal-demands-california-energy-data>

“An experiment too expensive for consumers”: http://articles.chicagotribune.com/2011-06-21/news/ct-oped-0621-madigan-20110621_1_smart-grid-america-come

Dr. Paul Dart’s “Biological and Health Effects of Microwave RF Transmissions”, a report to the Eugene Oregon water and electric board, including a review of the research literature: <http://skyvisionsolutions.files.wordpress.com/2013/11/paul-dart-md-lead-author-report-to-eweb-june-2013.pdf>

“The Value of Solar” highlights industry’s efforts to *impede* the growth of solar:

<http://gettingsmarteraboutthesmartgrid.org/solaroped.xhtml>

“Getting Smart about the Smart Grid” by Timothy Schoechle, Ph.D. and the National Institute for Science, Law and Public Policy, Nov. 2012 (an energy and electricity policy white paper). [Note - this article is in error where it suggests using powerline networks as an alternative.]:

<http://electromagnetichealth.org/wp-content/uploads/2014/02/Smart-Grid-Report-3-15-13.pdf>

For more articles: <http://www.conradbiologic.com/articles.html>

For any questions, contact me at: rconrad999@hawaii.rr.com

NOTES

More on Safeguards

Safeguards must include enforcement provisions to ensure that only meters and associated systems that are inspected (by truly independent labs) and pass *new* human health safety requirements are allowed. If digital smart meters are used they should not have any kind of wireless transmitter. Any digital meters must have ultra-low radiated and conducted emissions (to new, not current FCC standards), a linear and filtered power supply (no SMPS or PWM DC-DC converter), and a fully shielded and filtered wired (or optical) modem, if any. Without a transmitter, the power usage of a digital meter would be only a tiny fraction of a watt.

In the analog electromechanical meter, the power conserved by not having any transmitter or power supply more than makes up for its lack of responsiveness to the very tiny loads of modern electronics on standby (though such power usage *does* register if any larger load is also drawing power at the same time). It would be safest to use analog mechanical meters. For more necessary safeguards, see “SUGGESTIONS FOR ALTERNATIVES” in the “Notes for Conclusion” section near the end of my “Nine Reasons...” article [13].

Conducted Microwaves

The FCC does not test for *conducted* microwave energy, only *radiated* emissions. In contrast to standards for *radiated* microwave energy, the FCC Part 15 conducted energy regulations do not specify any limit for microwaves conducted on power lines. Smart meters are tested to comply with conducted energy limits only below 30 MHz, but not at the 915 MHz frequency of their microwave transmitter.

“If the 915 MHz conducted (on house wiring into the house) energy (from the smart meter) were held to the same standard as 30 MHz, the level of the 915 MHz conducted energy from the AMR meter would fail (the FCC Part 15 test).....there was a substantial conducted 915 MHz component on the power line (at more than 12 feet from the smart meter).” From: “Report on Examination of Selected Sources of EMF at Selected

Residences in Hastings-on-Hudson” by Isotrope Wireless, November 23, 2013: <http://skyvisionsolutions.files.wordpress.com/2014/04/report-on-examination-of-selected-sources-of-emf-at-selected-residences.pdf>.

This report provides evidence that microwave levels will not decrease with distance as expected, because microwave energy is conducted some distance along wiring in the street, and along wiring in the walls of homes into more distant rooms, and reradiates from these wires as well as from lamps and other plugged-in appliances. The FCC has no limit for conducted microwave energy.

This report also says that this particular smart meter had low enough conducted RF at frequencies *below 30 MHz* such that it was in compliance with FCC Part 15 requirements. This means that its switching power supply (“SMPS”) created no more dirty power than the many other SMPS (all of which have to be in compliance with FCC Part 15) that some people have plugged into their wall outlets and did not cause any symptoms until their smart meter was installed. Thus it seems that *conducted* emission from the SMPS would not be a major contributor to sensitization in this case.

The Devil may be in the Details

Modulation and pulses within pulses are what enable a microwave pulse to carry and impart information, and this is true for the “packets” transmitted by smart meters. Pulsed and/or modulated microwaves have been found to be more biologically damaging than continuous microwaves. “Peer-reviewed studies have shown that the differences in modulation patterns and waveforms can produce quite different biological effects” <http://sagereports.com/smart-meter-rf/?p=368>. Modulation is when the microwave frequency is pulsed and/or has a lower frequency signal superimposed on it. “....studies of modulated RF signals report changes in *human* cognition, reaction time, brainwave activity, sleep disruption and immune function.” http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec15_2007_Modulation_Blackman.pdf.

The EPA has admitted that biological tissue is able to demodulate (extract and respond to) low frequencies (EPA-SAB-RAC-92-013, page 4).

An Efficient Delivery System

All the spaces we occupy are now filled with electromagnetic radiation at microwave frequencies that are completely absorbed by human tissue within the first few inches of penetration. Most of these microwaves are not reflected from the body surface, do not pass freely through the body to exit the other side, and are not absorbed in the skin itself, but most of the energy penetrates a few inches deep into our tissue and is completely absorbed there.

Since this microwave energy is often modulated with a range of lower frequencies, this constitutes a delivery system that enables a whole range of frequencies to be deposited directly inside the body. (Most of these lower frequencies would otherwise not be absorbed at all and their non-thermal effects would then be via induction, a different mechanism.) Although this delivery of frequencies is inadvertent, it is a result of many of today’s microwave technologies, which are usually pulsed and/or modulated.

It may be that the use of other frequencies, other rates of pulsing and different types of modulation would have far less biological effect, but conducting such research or making changes at this point would be an admission that there might be a problem, and government agencies and corporations seem committed to defend their present policies and standards. ***Short-term harm to those with ES, the conversion of normal persons to become ES, and possible long-term harm to everyone is being consciously overlooked.*** Corporations and government agencies still pretend that there are no biological effects - see no evil, hear no evil, do no evil.

Review Articles and Weight-of-Evidence

Industry has been waging an aggressive, proactive and multi-faceted propaganda campaign. They have sponsored many meta-analysis reviews that, by discarding research showing harm because it has not been reproduced exactly, or because they do not like the results, boils down mostly to research that shows no biological effects - which usually is the research funded by industry. Then they place the volumes of meta-analyses and industry-sponsored papers on one side of a scale or balance, the papers that find biological harm on the other side, and declare “no harm” based on the weight-of-evidence principle. In other words, because a pile of junk weighs more than a few diamonds, it is worth more. In reality, most non-thermal studies funded by industry show no effects, and most publicly funded non-thermal studies do show effects; see Fig. 1. of “Business Bias as Usual” at: <http://www.conradbiologic.com/pdfs/Electromagnetic-Business-Bias.pdf> (This article is taken from the book edited by Elsner, W. et al: “Social Costs Today. Institutional Analyses of the Present Crises”, published by Routledge, 2012:225-68.)

Doubt is their Product

Industry’s deceptive literature is an attempt to conceal the fact that wireless smart meters result in numerous serious disadvantages to customers and benefit only the utilities. For an understanding of what is behind the propaganda of and “expert” testimony from industry, see “Doubt is their Product”: <http://defendingscience.org/writing-and-speeches/doubt-their-product>

Time of Use Billing

Time of use billing is undesirable and unfair for many reasons. The Berkshire-Litchfield Environmental Council said: “many people and businesses simply cannot change when or how they use energy. Tiered pricing automatically penalizes the elderly, the self-employed, the infirm, the unemployed, stay-at-home parents with young children and anyone else who functions on a normal daylight schedule. People can choose to do their laundry later at night but meals and bathing carry fewer options.” From: <http://smartgridawareness.org/2013/08/27/the-smart-grid-is-not-smart-safe-or-green/>

In many areas of the country, as more and more alternative energy sources come on-line, power plants will have the excess capacity to handle peak loads.